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## Ascham School

## Year 12 Mathematics Standard 2

## TRIAL EXAMINATION

## Date: 2 August 2019

Time: $2^{11 / 2}$ hours

## General Instructions

- Reading time - 10 minutes.
- Working time $-2 \frac{1}{2}$ hours.
- Write using black pen.
- Approved calculators may be used.
- A formulae sheet is provided.


## Result



Total marks - 100

## Section I

15 Marks

- Attempt Questions 1-15.
- Allow about 25 minutes for this section.
- Record your answers on the multiple choice answer sheet.


## Section II

85 Marks

- Attempt Questions 16-21.
- Allow about 2 hours 5 minutes for this section.
- Answer in the space provided.


## Section I - Multiple Choice Answer Sheet

| 1 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| :---: | :---: | :---: | :---: | :---: |
| 2 | A $\bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 3 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 4 | A $\bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 5 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 6 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |
| 7 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |
| 8 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |
| 9 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |
| 10 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |
| 11 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 12 | $A \bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 13 | A | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |
| 14 | A $\bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D $\bigcirc$ |
| 15 | A $\bigcirc$ | $B \bigcirc$ | $\mathrm{C} \bigcirc$ | D |

## Section I

## 15 marks

## Attempt Questions 1-15

Allow about $\mathbf{2 5}$ minutes for this section
Use the multiple-choice answer sheet for Questions 1-15.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.
Sample
$2+4=(\mathrm{A}) 2$
(B) 6
(C) 8
(D) 9
$\mathrm{A} \bigcirc$
B
$\mathrm{C} \bigcirc$
$\mathrm{D} \bigcirc$
If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.
A
B

$\mathrm{C} \bigcirc$
$\mathrm{D} \bigcirc$

If you have changed your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word correct and drawing an arrow as follows:


1 Which statement is true for the given triangle?
(A) $x^{2}=20^{2}-18^{2}$

(B) $x^{2}=20^{2}-18^{2}+2 \times 20 \times 18 \times \cos 65^{\circ}$
(C) $\frac{x}{\sin 65^{\circ}}=\frac{18}{\sin 48^{\circ}}$
(D) $x=\frac{1}{2} \times 20 \times 18 \times \sin 65^{\circ}$

2 The results of Mathematics exam were normally distributed.
Betty gained a $z$-score of -2 .
What percentage of students scored better than Betty?
(A) $84 \%$
(B) $97.5 \%$
(C) $95 \%$
(D) $2.5 \%$ Which line below has the equation $y=4-3 x$ ?

(A) Line $a$
(B) Line $b$
(C) Line $c$
(D) Line $d$

4 The equation of the graph below is:

(A) $y=3-x^{2}$
(B) $y=-x^{2}$
(C) $y=x^{2}-3$
(D) $y=x^{2}+3$

5 Grant wins $\$ 500$ and invests it 4 years at $8 \%$ p.a. interest compunded quarterly. To calculate the amount of interest earned on the investment, Grant would use:
(A) $500 \times 1.02^{16}-500$
(B) $500 \times 0.8 \times 4$
(C) $500 \times(1+0.02)^{16}$
(D) $500 \times 1.08^{4}-500$

(A)
(C)
(B)

$\cdots \quad$.
(D)

$\cdots \quad$.
$7 \quad$ What is the compass bearing of $P$ from $O$ ?

(A) $\mathrm{E} 30^{\circ} \mathrm{N}$
(B) $\mathrm{N} 30^{\circ} \mathrm{E}$
(C) $\mathrm{S} 120^{\circ} \mathrm{E}$
(D) $\mathrm{N} 60^{\circ} \mathrm{E}$

8 Which of the following is the fastest speed?
(A) $20 \mathrm{~m} / \mathrm{s}$
(B) $60 \mathrm{~km} / \mathrm{h}$
(C) $100 \mathrm{~m} / \mathrm{min}$
(D) $25000 \mathrm{~m} / \mathrm{h}$

9 A ship sails a distance of 50 km on a bearing of $040^{\circ}$.
Which expression can be used to find how far east the ship travelled?

(A) $50 \times \cos 40^{\circ}$
(B) $50 \times \sin 40^{\circ}$
(C) $\frac{50}{\sin 40^{\circ}}$
(D) $50 \times \tan 40^{\circ}$

10 For the network below, $B A D C B E A$ represents:

(A) A path
(B) An Eulerian Circuit
(C) An Eulerian Trail
(D) A cycle

11 If it is 10:35 am in Vancouver (UTC -8) what is the local time in Paris (UTC +1)?
(A) $1: 35 \mathrm{am}$
(B) $5: 35 \mathrm{pm}$
(C) $3: 35 \mathrm{am}$
(D) $7: 35 \mathrm{pm}$

12 Convert $8.5 \mathrm{~m}^{2}$ to $\mathrm{cm}^{2}$ ?
(A) 85
(B) 8500
(C) 850
(D) 85000

13 The Whitney Hotel in London offers the following menu options for its Christmas Lunch.

```
                    Starters
            HOMEMADE CARROT AND CORIANDER SOUP
                Served witha warw. crasty roll and butter
                    PRAWN COCKTAIL
```



```
            HOMEMADE DUCK AND PORK TERRINE
            Served with a cruaty roll and our chef'sown recipe spiced plum chutney
                    Mains
                    CHRISTMAS DINNER
            Roauted Tirkey and all the trafliconal rimminga
                    ROAST SALMON
        Served in a creawy white wine, asparagns, chive, and labster reducrion
                        BEEF MEDALLIONS
            Pan fried in a fricassee of wild mushroon and cream
                    VEGETARIAN NUT ROAST
                    Nar roasr with all the trimmings
                    Desserts
            CHRISTMAS PUDDING WITH BRANDY SAUCE
    HOMEMADE STICKY TOFFEE PUDDING & A RICH TOFFEE SAUCE
    HOMEMADE LEMON CHEESECAKE WITH MIXED FRUIT COULIS
```

How many 3-course selections are possible?
(A) 3
(B) 24
(C) 10
(D) 36

14 What is the effect of a $40 \%$ increase, followed by a $40 \%$ decrease on a sum of money?
(A) An overall increase on the original amount.
(B) An overall decrease on the original amount.
(C) No change to the original amount.
(D) Not enough information has been provided.

15 Rachel measures the length of a window to be 250 cm , correct to the nearest centimetre. What is the percentage error in her measurement?
(A) $\pm 0.002 \%$
(B) $\pm 0.004 \%$
(C) $\pm 0.2 \%$
(D) $\pm 0.4 \%$

## End of Section I

## Section II

## 85 marks

Attempt all questions
Allow about 2 hours and 5 minutes for this section
Answer each question in the space provided.
Show all relevant working in questions involving calculations.
Additional writing space is available at the back of this booklet.

## Question 16 ( 15 marks)

a) Allison uses a dishwasher with a rating of 800 W for 2.5 hours each day. Find the daily cost of electricity for using the dishwasher if electricity is charged at a rate of 21.40 cents per kWh .
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$\qquad$
b) Maddie and Annie made a seesaw as per diagram below. It is known that the weight of a person, $w$, varies inversely to the distance of a person to the middle of the seesaw, $d$.

The equation $w=\frac{k}{d}$, where $k$ is a constant, models this situation.

i) Given that Maddie weighs 65 kg and is sitting 1.20 m away from the middle of the seesaw, find the value of the constant, $k$ and state the equation of the relationship.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
ii) Annie weighs 40 kg . Find the distance at which she needs to sit for the seesaw to work.
$\qquad$
$\qquad$
$\qquad$
c) Consider the network below.

i) State the number of edges in the network.
$\qquad$
$\qquad$
ii) Find the sum of the degrees of the vertices in the network?
$\qquad$
$\qquad$
iii) Write one path that includes all of the vertices.
iv) Does this network have an Eulerian trail? Explain why.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
v) Find one spanning tree for this network.
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$\qquad$
d) Monique purchased new appliances after renovating her home. The appliances depreciate at a rate of $15 \%$ per annum. After the three years, the appliances are worth \$19 770.

What was the original purchase price of the appliances? Give your answer correct to the nearest dollar.
$\qquad$
$\qquad$
$\qquad$
e) There are 2480 phone numbers on a list. Every $8^{\text {th }}$ number is phoned.

What type of sampling is this?

## End of Question 16

## Question 17 (15 marks)

a) A three-digit number is made up of the digits 4,5 and 8 . If the digits are not repeated, what is the probability that the number:
i) is even?
$\qquad$
$\qquad$
$\qquad$
ii) ends in 5 ?
$\qquad$
$\qquad$
$\qquad$
b) Given $B A C_{M A L E}=\frac{10 N-7.5 H}{6.8 M}$ calculate the $B A C$ for a 95 kilogram male who has consumed 3 standard drinks between 7 pm and 9.30 pm .
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$\qquad$
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$\qquad$
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$\qquad$
$\qquad$
$\qquad$
c) Mel leaves Darwin $(\mathrm{UTC}+9.5)$ at 1.40 pm on Monday and arrives in Singapore $(\mathrm{UTC}+8)$ at 4.50 pm on Monday. How long is Mel's direct flight from Darwin to Singapore?
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$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
d) For a data set that is normally distributed and $z$ is the standardised score, find the following using the table of standard normal distribution below:

| $z$ | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0.0 | .50000 | .50399 | .50798 | .51197 | .51595 | .51994 | .52392 | .52790 | .53188 | .53586 |
| 0.1 | .53983 | .54380 | .54776 | .55172 | .55567 | .55966 | .56360 | .56749 | .57142 | .57535 |
| 0.2 | .57926 | .58317 | .58706 | .59095 | .59483 | .59871 | .60257 | .60642 | .61026 | .61409 |
| 0.3 | .61791 | .62172 | .62552 | .62930 | .63307 | .63683 | .64058 | .64431 | .64803 | .65173 |
| 0.4 | .65542 | .65910 | .66276 | .66640 | .67003 | .67364 | .67724 | .68082 | .68439 | .68793 |
| 0.5 | .69146 | .69497 | .69847 | .70194 | .70540 | .70884 | .71226 | .71566 | .71904 | .72240 |
| 0.6 | .72575 | .72907 | .73237 | .73565 | .73891 | .74215 | .74537 | .74857 | .75175 | .75490 |
| 0.7 | .75804 | .76115 | .76424 | .76730 | .77035 | .77337 | .77637 | .77935 | .78230 | .78524 |
| 0.8 | .78814 | .79103 | .79389 | .79673 | .79955 | .80234 | .80511 | .80785 | .81057 | .81327 |
| 0.9 | .81594 | .81859 | .82121 | .82381 | .82639 | .82894 | .83147 | .83398 | .83646 | .83891 |
| 1.0 | .84134 | .84375 | .84614 | .84849 | .85083 | .85314 | .85543 | .85769 | .85993 | .86214 |
| 1.1 | .86433 | .86650 | .86864 | .87076 | .87286 | .87493 | .87698 | .87900 | .88100 | .88298 |
| 1.2 | .88493 | .88686 | .88877 | .89065 | .89251 | .89435 | .89617 | .89796 | .89973 | .90147 |
| 1.3 | .90320 | .90490 | .90658 | .90824 | .90988 | .91149 | .91308 | .91466 | .91621 | .91774 |
| 1.4 | .91924 | .92073 | .92220 | .92364 | .92507 | .92647 | .92785 | .92922 | .93056 | .93189 |
| 1.5 | .93319 | .93448 | .93574 | .93699 | .93822 | .93943 | .94062 | .94179 | .94295 | .94408 |

i) $P(z>1.43)$
ii) What is the probability that a randomly chosen score has a $z$-score that falls into the shaded areas on the diagram below?

$\qquad$
$\qquad$
$\qquad$
$\qquad$
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$\qquad$
$\qquad$
e) Consider the diagram below.

i) Use the cosine rule to show that $\theta=128^{\circ}$, correct to the nearest degree.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
ii) What is the angle of elevation of $B$ from $D$.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
iii) Find the bearing of $D$ from $B$.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
iv) Find the length of $A C$, correct to one decimal place.
$\qquad$
$\qquad$
(2)
$\qquad$
$\qquad$
$\qquad$

## Question 18 (15 marks)

a) The side of the square base of one of the smaller pyramids in Giza has length of 1.4 cm on the map.

The scale used is $1: 15000$.

i) What is the actual length of the side of the pyramid's base in metres?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
ii) Each side of the pyramid forms an isosceles triangle as per diagram on the right. Find the actual length of the slant edge of the pyramid.

edge of the pyramıa.
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$\qquad$
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$\qquad$
$\qquad$
$\qquad$
iii) The ratio of base edges of the
 smaller to larger pyramids are in the ratio 7:13.
Find the area of the square base of the larger pyramid.
b) The volume of a sphere is $4988.92 \mathrm{~cm}^{3}$. Find, correct to 1 decimal place, the sphere's:
i) radius.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
ii) surface area.
$\qquad$
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$\qquad$
c) i) Use the Trapezoidal rule to estimate the area of the reservoir in the diagram below. Answer correct to the nearest square metre.

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$\qquad$
ii) What is the capacity of the reservoir in ML, if it is 2.4 m deep?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
d) The table below shows the future value of an annuity with a contribution of $\$ 1$.

| Period | Interest rate per period |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathbf{2 \%}$ | $\mathbf{2 . 5 \%}$ | $\mathbf{3 \%}$ | $\mathbf{3 . 5 \%}$ | $\mathbf{4 \%}$ | $\mathbf{4 . 5 \%}$ | $\mathbf{5 \%}$ | $\mathbf{5 . 5 \%}$ | $\mathbf{6 \%}$ | $\mathbf{8 \%}$ |  |
| $\mathbf{1}$ | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |  |
| $\mathbf{2}$ | 2.0200 | 2.0250 | 2.0300 | 2.0350 | 2.0400 | 2.0450 | 2.0500 | 2.0550 | 2.0600 | 2.0800 |  |
| $\mathbf{3}$ | 3.0604 | 3.0756 | 3.0909 | 3.1062 | 3.1216 | 3.1370 | 3.1525 | 3.1680 | 3.1836 | 3.2464 |  |
| $\mathbf{4}$ | 4.1216 | 4.1525 | 4.1836 | 4.2149 | 4.2465 | 4.2782 | 4.3101 | 4.3423 | 4.3746 | 4.5061 |  |
| $\mathbf{5}$ | 5.2040 | 5.2563 | 5.3091 | 5.3625 | 5.4163 | 5.4707 | 5.5256 | 5.5811 | 5.6371 | 5.8666 |  |
| $\mathbf{6}$ | 6.3081 | 6.3877 | 6.4684 | 6.5502 | 6.6330 | 6.7169 | 6.8019 | 6.8881 | 6.9753 | 7.3359 |  |
| $\mathbf{7}$ | 7.4343 | 7.5474 | 7.6625 | 7.7794 | 7.8983 | 8.0192 | 8.1420 | 8.2669 | 8.3938 | 8.9228 |  |
| $\mathbf{8}$ | 8.5830 | 8.7361 | 8.8923 | 9.0517 | 9.2142 | 9.3800 | 9.5491 | 9.7216 | 9.8975 | 10.6366 |  |
| $\mathbf{9}$ | 9.7546 | 9.9545 | 10.1591 | 10.3685 | 10.5828 | 10.8021 | 11.0266 | 11.2563 | 11.4913 | 12.4876 |  |
| $\mathbf{1 0}$ | 10.9497 | 11.2034 | 11.4639 | 11.7314 | 12.0061 | 12.2882 | 12.5779 | 12.8754 | 13.1808 | 14.4866 |  |
| $\mathbf{1 1}$ | 12.1687 | 12.4835 | 12.8078 | 13.1420 | 13.4864 | 13.8412 | 14.2068 | 14.5835 | 14.9716 | 16.6455 |  |
| $\mathbf{1 2}$ | 13.4121 | 13.7956 | 14.1920 | 14.6020 | 15.0258 | 15.4640 | 15.9171 | 16.3856 | 16.8699 | 18.9771 |  |
| $\mathbf{1 5}$ | 17.2934 | 17.9319 | 18.5989 | 19.2957 | 20.0236 | 20.7841 | 21.5786 | 22.4087 | 23.2760 | 27.1521 |  |
| $\mathbf{1 8}$ | 21.4123 | 22.3863 | 23.4144 | 24.4997 | 25.6454 | 26.8551 | 28.1324 | 29.4812 | 30.9057 | 37.4502 |  |
| $\mathbf{2 0}$ | 24.2974 | 25.5447 | 26.8704 | 28.2797 | 29.7781 | 31.3714 | 33.0660 | 34.8683 | 36.7856 | 45.7620 |  |

i) Angela is saving for a holiday by contributing $\$ 500$ into an annuity that pays interest at the rate of $8 \%$ p.a., compounded quarterly. Use the table above to find how much she will have in 2 years' time.
$\qquad$
$\qquad$
$\qquad$
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$\qquad$
ii) Milla is saving for the same trip and needs $\$ 7000$ in total. How much more than Angela does she need to contribute each quarter, using the same annuity, if she wishes to have enough money in 2 years' time?
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## Question 19 (15 marks)

a) Belinda wishes to invest her savings into shares and is considering two suitable options.

Option 1: 1500 shares which have a market price of $\$ 2.15$ each, with dividend yield of $15 \%$ and brokerage of $3 \%$.

Option 2: 1000 shares which have a market price of $\$ 3.45$ each and pay dividend of 32 cents per share. Brokerage is $2.5 \%$.
i) Which option will cost less in terms of brokerage?
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ii) Which option is cheaper in terms of total cost of purchasing shares?
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$\qquad$
iii) Belinda chose Option 2. Find her expected dividend yield.
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$\qquad$
iv) Belinda suddenly needs to cash in her shares. She managed to sell them at the market price of $\$ 3.55$, but had to pay a higher brokerage fee of $2.9 \%$.

Did she made a profit or loss with this sale? Calculate this amount.
$\qquad$
$\qquad$
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$\qquad$
b) The table below is used to represent a network.

|  |  | TO |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | P | Q | R | S | T |
| $\begin{aligned} & \underset{\sim}{x} \\ & \underset{y}{x} \end{aligned}$ | P | - | 9 | - | 25 | 15 |
|  | Q | 9 | - | 5 | 12 | 20 |
|  | R | - | 5 | - | 30 | 3 |
|  | S | 25 | 12 | 30 | - | 35 |
|  | T | 15 | 20 | 3 | 35 | - |

i) Draw a weighted network that is represented by the given table.
[2]
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ii) Find the minimum spanning tree. Additional space provided on the next page.
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$\qquad$
c) Tilly owns a car which she uses both in the city and in the country.

The fuel consumption rate in the city is $10.5 \mathrm{~L} / 100 \mathrm{~km}$.
When she was last in the country, she used 28L of petrol and travelled 350 kilometres.
i) Show that the fuel consumption rate in the country is $8 \mathrm{~L} / 100 \mathrm{~km}$.
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$\qquad$
ii) Last year, Tilly drove 14000 km in the city and 20000 km in the country.

How much fuel did she use in total?
$\qquad$ .....
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
iii) Tilly spends an average of $\$ 4500$ on fuel per year.

She is considering switching to a cheaper fuel that costs $\$ 1.30 / \mathrm{L}$. How much money she would have saved last year if she had used this cheaper fuel?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$


$\qquad$
$\qquad$

## Question 20 ( 15 marks)

a) The cost of catering is related to the number of people attending an event, as per table below.

| Number of people $-n$ | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cost $-C$ | 65 | 92 | 110 | 119 | 143 | 162 | 175 | 190 | 204 | 240 |

## i) Find, correct to 4 decimal places, Pearson's correlation coefficient, $r$.

ii) Calculate the mean and standard deviation of the number of people, $\bar{x}_{n}$ and $\sigma_{n}$. Give your answers correct to 2 decimal places.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
iii) Calculate the mean and standard deviation of the cost, $\bar{x}_{C}$ and $\sigma_{C}$, correct to 2 decimal places.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\rightarrow$
iv) Show that the equation of the least-squares line of best fit is given by $C=3.57 n+51.83$.
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$\qquad$
v) Use the equation to calculate the cost of catering for a hundred people.
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$\qquad$
$\qquad$
$\qquad$
b) A speed camera on the road in outback records car speeds and the results are normally distributed with mean speed of $65 \mathrm{~km} / \mathrm{h}$ and standard deviation of 15 $\mathrm{km} / \mathrm{h}$.

Complete the diagram below by entering the appropriate values in the red boxes.

i) What percentage of drivers drive at a speed between $35 \mathrm{~km} / \mathrm{h}$ and $80 \mathrm{~km} / \mathrm{h}$ ?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
ii) Millie was faster than $16 \%$ of all drivers. What was her speed?
$\qquad$
$\qquad$
$\qquad$
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iii) Given that the speed limit is $70 \mathrm{~km} / \mathrm{h}$, what percentage of drivers recorded will be fined for exceeding the speed limit? Refer to the standard normal distribution table on the next page.
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Standard normal distribution table

| $z$ | . 00 | . 01 | . 02 | . 03 | . 04 | . 05 | . 06 | . 07 | . 08 | . 09 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0.0 | . 50000 | . 50399 | . 50798 | . 51197 | . 51595 | . 51994 | . 52392 | . 52790 | . 53188 | . 53586 |
| 0.1 | . 53983 | . 54380 | . 54776 | . 55172 | . 55567 | . 55966 | . 56360 | . 56749 | . 57142 | . 57535 |
| 0.2 | . 57926 | . 58317 | . 58706 | . 59095 | . 59483 | . 59871 | . 60257 | . 60642 | . 61026 | . 61409 |
| 0.3 | . 61791 | . 62172 | . 62552 | . 62930 | . 63307 | . 63683 | . 64058 | . 64431 | . 64803 | . 65173 |
| 0.4 | . 65542 | . 65910 | . 66276 | . 66640 | . 67003 | . 67364 | . 67724 | . 68082 | . 68439 | . 68793 |
| 0.5 | . 69146 | . 69497 | . 69847 | . 70194 | . 70540 | . 70884 | . 71226 | . 71566 | . 71904 | . 72240 |
| 0.6 | . 72575 | . 72907 | . 73237 | . 73565 | . 73891 | . 74215 | . 74537 | . 74857 | . 75175 | . 75490 |
| 0.7 | . 75804 | . 76115 | . 76424 | . 76730 | . 77035 | . 77337 | . 77637 | . 77935 | . 78230 | . 78524 |
| 0.8 | . 78814 | . 79103 | . 79389 | . 79673 | . 79955 | . 80234 | . 80511 | . 80785 | . 81057 | . 81327 |
| 0.9 | . 81594 | . 81859 | . 82121 | . 82381 | . 82639 | . 82894 | . 83147 | . 83398 | . 83646 | . 83891 |
| 1.0 | . 84134 | . 84375 | . 84614 | . 84849 | . 85083 | . 85314 | . 85543 | . 85769 | . 85993 | . 86214 |
| 1.1 | . 86433 | . 86650 | . 86864 | . 87076 | . 87286 | . 87493 | . 87698 | . 87900 | . 88100 | . 88298 |
| 1.2 | . 88493 | . 88686 | . 88877 | . 89065 | . 89251 | . 89435 | . 89617 | . 89796 | . 89973 | . 90147 |
| 1.3 | . 90320 | . 90490 | . 90658 | . 90824 | . 90988 | . 91149 | . 91308 | . 91466 | . 91621 | . 91774 |
| 1.4 | . 91924 | . 92073 | . 92220 | . 92364 | . 92507 | . 92647 | . 92785 | . 92922 | . 93056 | . 93189 |
| 1.5 | . 93319 | . 93448 | . 93574 | . 93699 | . 93822 | . 93943 | . 94062 | . 94179 | . 94295 | . 94408 |
| 1.6 | . 94520 | . 94630 | . 94738 | . 94845 | . 94950 | . 95053 | . 95154 | . 95254 | . 95352 | . 95449 |
| 1.7 | . 95543 | . 95637 | . 95728 | . 95818 | . 95907 | . 95994 | . 96080 | . 96164 | . 96246 | . 96327 |
| 1.8 | . 96407 | . 96485 | . 96562 | . 96638 | . 96712 | . 96784 | . 96856 | . 96926 | . 96995 | . 97062 |
| 1.9 | . 97128 | . 97193 | . 97257 | . 97320 | . 97381 | . 97441 | . 97500 | . 97558 | . 97615 | . 97670 |
| 2.0 | . 97725 | . 97778 | . 97831 | . 97882 | . 97932 | . 97982 | . 98030 | . 98077 | . 98124 | . 98169 |
| 2.1 | . 98214 | . 98257 | . 98300 | . 98341 | . 98382 | . 98422 | . 98461 | . 98500 | . 98537 | . 98574 |
| 2.2 | . 98610 | . 98645 | . 98679 | . 98713 | . 98745 | . 98778 | . 98809 | . 98840 | . 98870 | . 98899 |
| 2.3 | . 98928 | . 98956 | . 98983 | . 99010 | . 99036 | . 99061 | . 99086 | . 99111 | . 99134 | . 99158 |
| 2.4 | . 99180 | . 99202 | . 99224 | . 99245 | . 99266 | . 99286 | . 99305 | . 99324 | . 99343 | . 99361 |
| 2.5 | . 99379 | . 99396 | . 99413 | . 99430 | . 99446 | . 99461 | . 99477 | . 99492 | . 99506 | . 99520 |
| 2.6 | . 99534 | . 99547 | . 99560 | . 99573 | . 99585 | . 99598 | . 99609 | . 99621 | . 99632 | . 99643 |
| 2.7 | . 99653 | . 99664 | . 99674 | . 99683 | . 99693 | . 99702 | . 99711 | . 99720 | . 99728 | . 99736 |
| 2.8 | . 99744 | . 99752 | . 99760 | . 99767 | . 99774 | . 99781 | . 99788 | . 99795 | . 99801 | . 99807 |
| 2.9 | . 99813 | . 99819 | . 99825 | . 99831 | . 99836 | . 99841 | . 99846 | . 99851 | . 99856 | . 99861 |
| 3.0 | . 99865 | . 99869 | . 99874 | . 99878 | . 99882 | . 99886 | . 99889 | . 99893 | . 99896 | . 99900 |
| 3.1 | . 99903 | . 99906 | . 99910 | . 99913 | . 99916 | . 99918 | . 99921 | . 99924 | . 99926 | . 99929 |
| 3.2 | . 99931 | . 99934 | . 99936 | . 99938 | . 99940 | . 99942 | . 99944 | . 99946 | . 99948 | . 99950 |
| 3.3 | . 99952 | . 99953 | . 99955 | . 99957 | . 99958 | . 99960 | . 99961 | . 99962 | . 99964 | . 99965 |
| 3.4 | . 99966 | . 99968 | . 99969 | . 99970 | . 99971 | . 99972 | . 99973 | . 99974 | . 99975 | . 99976 |
| 3.5 | . 99977 | . 99978 | . 99978 | . 99979 | . 99980 | . 99981 | . 99981 | . 99982 | . 99983 | . 99983 |
| 3.6 | . 99984 | . 99985 | . 99985 | . 99986 | . 99986 | . 99987 | . 99987 | . 99988 | . 99988 | . 99989 |
| 3.7 | . 99989 | . 99990 | . 99990 | . 99990 | . 99991 | . 99991 | . 99992 | . 99992 | . 99992 | . 99992 |
| 3.8 | . 99993 | . 99993 | . 99993 | . 99994 | . 99994 | . 99994 | . 99994 | . 99995 | . 99995 | . 99995 |
| 3.9 | . 99995 | . 99995 | . 99996 | . 99996 | . 99996 | . 99996 | . 99996 | . 99996 | . 99997 | . 99997 |

c) Ella is considering options for a personal loan of \$50 000 .

Option 1: The graph shows the amount owing on her personal loan over a period of time and monthly repayments.


Option 2: Monthly reducible personal loan taken as per table below over the period of 15 years at $7.75 \%$ p.a.

| Term in years | 7\% | 7.25\% | 7.5\% | 7.75\% | 8\% | 8.25\% | 8.5\% |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5 | \$19.8012 | \$19.9194 | \$20.0379 | \$20.1570 | \$20.2765 | \$20.3963 | \$20.5164 |
| 10 | \$11.6108 | \$11.7401 | \$11.8702 | \$12.0011 | \$12.1328 | \$12.2653 | \$12.3985 |
| 15 | \$8.9883 | \$9.1286 | \$9.2701 | \$9.4128 | \$9.5566 | \$9.7014 | \$9.8474 |
| 20 | \$7.7530 | \$7.9036 | \$8.0559 | \$8.2095 | \$8.3644 | \$8.5207 | \$8.6782 |
| 25 | \$7.0678 | \$7.2281 | \$7.3899 | \$7.5533 | \$7.7182 | \$7.8875 | \$8.0522 |
| 30 | \$6.6530 | \$6.8218 | \$6.9921 | \$7.1641 | \$7.3377 | \$7.5127 | \$7.6891 |

Find which option is better for Ella by considering the total amount of interest charged and the total Ella can save over the term of the loan.
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## Question 21 (10 marks)

a)

Future value of an annuity

$$
F V=a\left\{\frac{(1+r)^{n}-1}{r}\right\} \quad \quad P V=a\left\{\frac{(1+r)^{n}-1}{r(1+r)^{n}}\right\}
$$

## Present value of an annuity

Sophie wishes to purchase a holiday home at a price of $\$ 340000$. She has a deposit of $\$ 70000$. She will take the loan over 25 years at $9.6 \%$ p.a. compounding monthly.

For the first 5 years she wishes to reduce her expenses by making interest only repayments.
i) Find Sophie's monthly repayment for the first five years of the loan period.
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ii) Find Sophie's monthly repayment for the remaining loan period.
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iii) Calculate the total amount of interest Sophie pays over the loan period.
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b) The annual interest rate on a credit card is $21.5 \%$ p.a.

There is an interest-free period of 55 days for purchases and a $1.5 \%$ fee for cash advances (added on at the end of the month).
Assume there is no interest-free period remaining on the opening balance.

| March Statement |  |  |
| :---: | :--- | :---: |
| Date | Details | Amount (\$) |
| 1 Mar | Opening balance | 450 |
| 7 Mar | Purchase | 230 |
| 12 Mar | Cash advance | 100 |
| 20 Mar | Payment | -500 |
| 25 Mar | Purchase | 350 |

Calculate the balance on this credit card at the end of March.
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## Extra writing space

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## NSW Education Standards Authority

## Mathematics Standard 1 <br> Mathematics Standard 2

## REFERENCE SHEET

## Measurement

## Limits of accuracy

Absolute error $=\frac{1}{2} \times$ precision
Upper bound $=$ measurement + absolute error
Lower bound = measurement - absolute error

## Length

$l=\frac{\theta}{360} \times 2 \pi r$

## Area

$A=\frac{\theta}{360} \times \pi r^{2}$
$A=\frac{h}{2}(a+b)$
$A \approx \frac{h}{2}\left(d_{f}+d_{l}\right)$

## Surface area

$A=2 \pi r^{2}+2 \pi r h$
$A=4 \pi r^{2}$

> Volume
> $V=\frac{1}{3} A h$
> $V=\frac{4}{3} \pi r^{3}$

## Trigonometry

$\sin A=\frac{\text { opp }}{\text { hyp }}, \quad \cos A=\frac{\text { adj }}{\text { hyp }}, \quad \tan A=\frac{\text { opp }}{\text { adj }}$
$A=\frac{1}{2} a b \sin C$
$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$
$c^{2}=a^{2}+b^{2}-2 a b \cos C$
$\cos C=\frac{a^{2}+b^{2}-c^{2}}{2 a b}$

## Financial Mathematics

$F V=P V(1+r)^{n}$

Straight-line method of depreciation
$S=V_{0}-D n$

## Declining-balance method of depreciation

$S=V_{0}(1-r)^{n}$

## Statistical Analysis

An outlier is a score
less than $Q_{1}-1.5 \times I Q R$
or
more than $Q_{3}+1.5 \times I Q R$
$z=\frac{x-\bar{x}}{s}$

Normal distribution


- approximately $68 \%$ of scores have $z$-scores between -1 and 1
- approximately $95 \%$ of scores have $z$-scores between -2 and 2
- approximately $99.7 \%$ of scores have $z$-scores between -3 and 3

