Questions for topic completed thus far

1    A set of 15 scores is displayed in a stem-and-leaf plot.

| 5 | 3 | 3 | 4 | | |
| 6 | 2 | 7 | 6 | 7 | |
| 7 | 7 | 7 | 7 | 8 | 9 |
| 8 | 2 | 2 | 4 | 5 | 7 |
| 9 | 1 | 3 | | | |

What is the median of these scores?

(A)  7

(B)  8

(C)  77

(D)  78

2    Handmade chocolates are checked for size and shape. Every 30th chocolate is sampled.
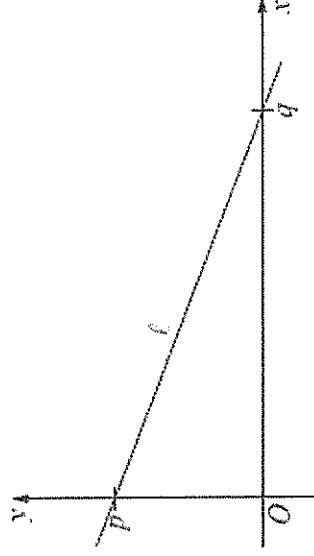
Which term best describes this type of sampling?

(A)  Census

(B)  Random

(C)  Stratified

(D)  Systematic

3    A pair of players is to be selected from 6 people.

How many different pairs of players can be selected?

(A)  6

(B)  12

(C)  15
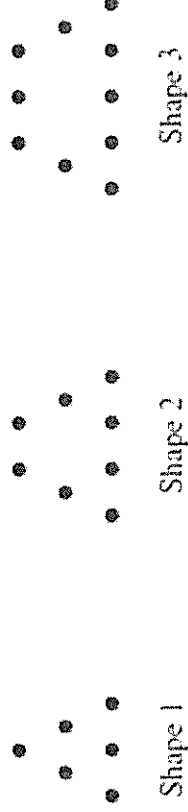
(D)  30

**5** The line $\ell$ has intercepts $p$ and $q$, where $p$ and $q$ are positive integers.



What is the gradient of line $\ell$?

(A) $-\dfrac{p}{q}$

(B) $-\dfrac{q}{p}$

(C) $\dfrac{p}{q}$

(D) $\dfrac{q}{p}$

**8** Dots were used to create a pattern. The first three shapes in the pattern are shown.



Shape 1          Shape 2          Shape 3

The number of dots used in each shape is recorded in the table.

| Shape ($S$) | 1 | 2 | 3 |
|---|---|---|---|
| Number of dots ($N$) | 6 | 8 | 10 |

How many dots would be required for Shape 156?

(A) 316

(B) 520

(C) 624

(D) 936

9  Tracy invests some money for 2 years at 4% per annum, compounded quarterly.

Compounded values of $1

| Period | Interest rate per period | | | | |
|---|---|---|---|---|---|
| | 1% | 2% | 3% | 4% | 5% |
| 1 | 1.010 | 1.020 | 1.030 | 1.040 | 1.050 |
| 2 | 1.020 | 1.040 | 1.061 | 1.082 | 1.103 |
| 3 | 1.030 | 1.061 | 1.093 | 1.125 | 1.158 |
| 4 | 1.041 | 1.082 | 1.126 | 1.170 | 1.216 |
| 5 | 1.051 | 1.104 | 1.159 | 1.217 | 1.276 |
| 6 | 1.062 | 1.126 | 1.194 | 1.265 | 1.340 |
| 7 | 1.072 | 1.149 | 1.230 | 1.316 | 1.407 |
| 8 | 1.083 | 1.172 | 1.267 | 1.369 | 1.477 |

Which figure from the table should Tracy use to calculate the value of her investment at the end of 2 years?

(A)  1.020

(B)  1.082

(C)  1.083

(D)  1.369

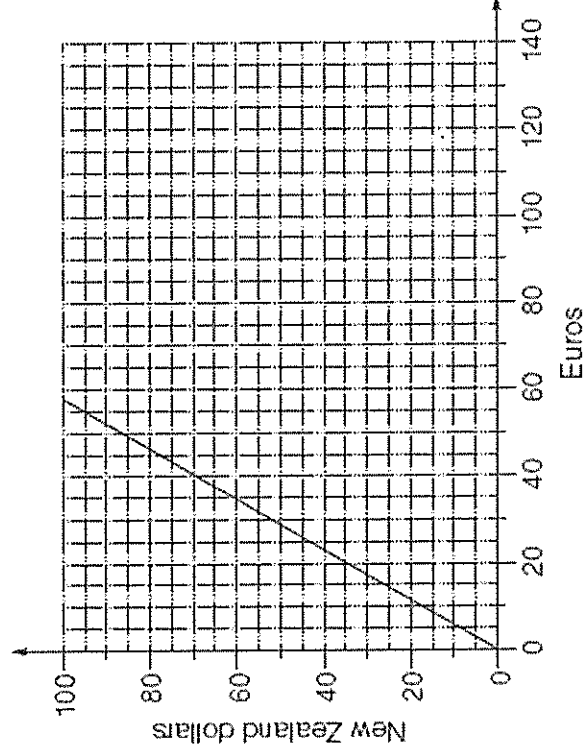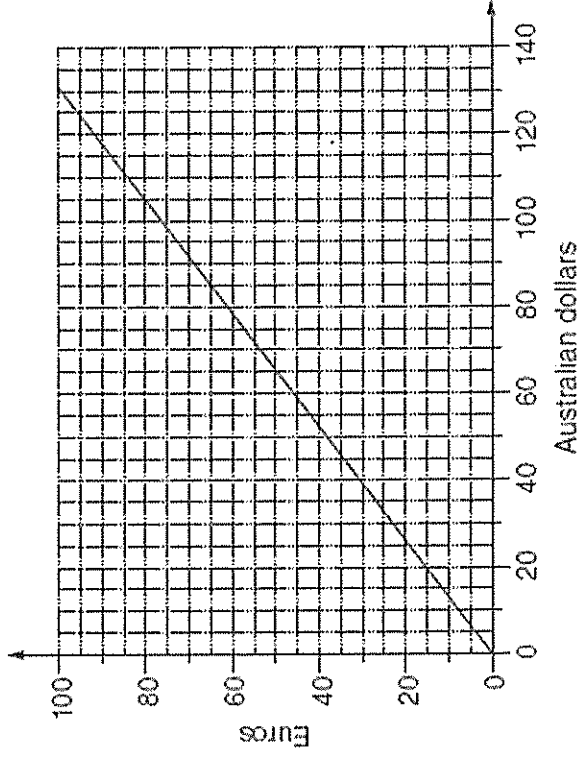12  Two unbiased dice, each with faces numbered 1, 2, 3, 4, 5 and 6, are rolled.

What is the probability of a 6 appearing on at least one of the dice?

(A)  $\frac{1}{6}$

(B)  $\frac{11}{36}$

(C)  $\frac{25}{36}$

(D)  $\frac{5}{6}$

14  Which of the following expresses  $2x^2(5-x)-x(x-2)$  in its simplest form?

(A)  $-2x^3+9x^2+2x$

(B)  $-2x^3-9x^2-2x$

(C)  $9x^2-x+2$

(D)  $9x^2-x-2$

13    Conversion graphs can be used to convert from one currency to another.



Sarah converted 60 Australian dollars into Euros. She then converted all of these Euros into New Zealand dollars.

How much money, in New Zealand dollars, should Sarah have?

(A)  $26

(B)  $45

(C)  $78

(D)  $135

**15** The time taken to complete a journey varies inversely with the speed of a car. A car takes 6 hours to complete a journey when travelling at 60 km/h.

How long would the same journey take if the car were travelling at 100 km/h?

(A) 36 minutes

(B) 1 hour and 40 minutes

(C) 3 hours and 6 minutes

(D) 3 hours and 36 minutes

**17** A spinner with different coloured sectors is spun 40 times. The results are recorded in the table.

| Colour obtained | Frequency |
|---|---|
| Red | 2 |
| Yellow | 4 |
| Blue | 6 |
| Orange | |
| Green | 10 |
| Purple | 12 |

What is the relative frequency of obtaining the colour orange?

(A) $\dfrac{3}{20}$

(B) $\dfrac{1}{5}$

(C) 6

(D) 8

**21** Which of the following correctly expresses $c$ as the subject of $E = mc^2 + p$?
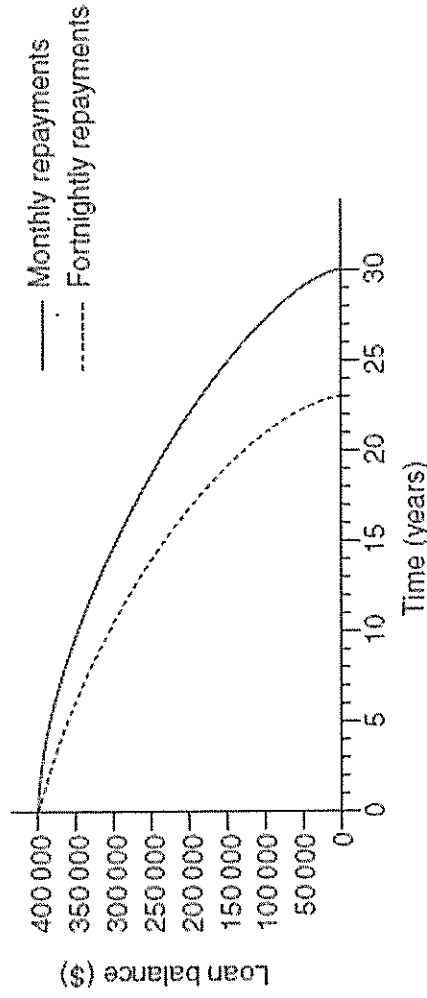
(A) $c = \pm\sqrt{\dfrac{E-p}{m}}$

(B) $c = \pm\dfrac{\sqrt{E-p}}{m}$

(C) $c = \pm\sqrt{\dfrac{E}{m}} - p$

(D) $c = \pm\sqrt{\dfrac{E}{m} - p}$

24  A $400 000 loan can be repaid by making either monthly or fortnightly repayments. The graph shows the loan balances over time using these two different methods of repayment.
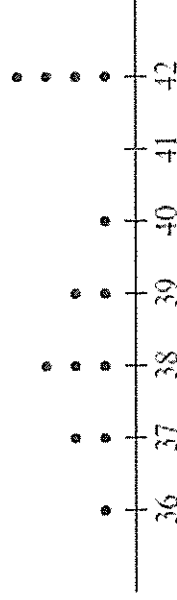


The monthly repayment is $2706.86 and the fortnightly repayment is $1404.76.

What is the difference in the total interest paid using the two different methods of repayment, to the nearest dollar?

(A)  $51 596

(B)  $166 823

(C)  $210 000

(D)  $234 936

Question 26

(e)  The dot plot shows the number of push-ups that 13 members of a fitness class can do in one minute.



(i)  What is the probability that a member selected at random from the class can do more than 38 push-ups in one minute?  1

(ii) A new member who can do 32 push-ups in one minute joins the class. Does the addition of this new member to the class change the probability calculated in part (e)(i)? Justify your answer.  1

(a) Postcodes in Australia are made up of four digits eg 2040.

(i) How many different postcodes beginning with a 2 are possible? 1

(ii) Peta remembers that the first two digits of a town's postcode are 2 and then 4. She is unable to remember the rest of the postcode.

$$\boxed{2}\ \boxed{4}\ \boxed{?}\ \boxed{?}$$

What is the probability that Peta guesses the correct postcode? 1

(b) Jim buys a photocopier for \$22 000. Its value is depreciated using the declining balance method at the rate of 15% per annum. 2

What is its value at the end of 3 years?

(c) Heather used her credit card to purchase a plane ticket valued at \$1990 on 28 January 2011. She made no other purchases on her credit card account in January. She paid the January account in full on 19 February 2011. 2

The credit card account has no interest free period. Simple interest is charged daily at the rate of 20% per annum, including the date of purchase and the date the account is paid.

How much interest did she pay, to the nearest cent?

## Question 26

(f) The capture-recapture technique was used to estimate a population of seals in 2012. 2

- 60 seals were caught, tagged and released.
- Later, 120 seals were caught at random.
- 30 of these 120 seals had been tagged.

The estimated population of seals in 2012 was 11% less than the estimated population for 2008.

What was the estimated population for 2008?

## Question 27

(a) Tai earns a gross weekly wage of \$1024. Each week her deductions are: 3

- tax instalment of \$296.40
- health fund contribution of \$24.50
- union fees of \$15.80.

She also pays \$3640 over the year as her share of the household expenses.

What percentage of her net wage does Tai pay for household expenses?

(b) Simplify fully $\dfrac{18ab}{3a^2} \times \dfrac{c}{b}$

2

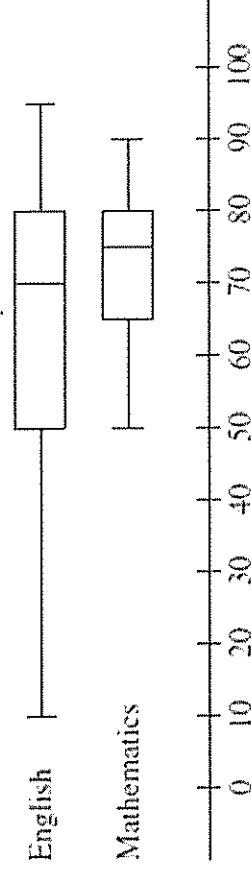(c) Matthew bought a laptop priced at $2800. He paid a 10% deposit and made monthly repayments of $95.20 for 3 years.

What annual flat rate of interest was Matthew charged? Justify your answer with suitable calculations.

4

(d) The test results in English and Mathematics for a class were recorded and displayed in the box-and-whisker plots.



(i) What is the interquartile range for English?

1

(ii) Compare and contrast the two data sets by referring to the skewness of the distributions and the measures of location and spread.

3

(e) A box contains 33 scarves made from two different fabrics. There are 14 scarves made from silk (S) and 19 made from wool (W).

Two girls each select, at random, a scarf to wear from the box.

(i) Copy and complete the probability tree diagram in your answer booklet.

2
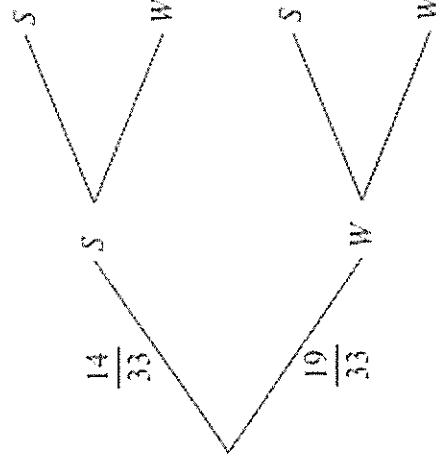


(ii) Calculate the probability that the two scarves selected are made from silk.

1

(iii) Calculate the probability that the two scarves selected are made from different fabrics.

2

## Question 30

(c) In 2010, the city of Thagoras modelled the predicted population of the city using the equation
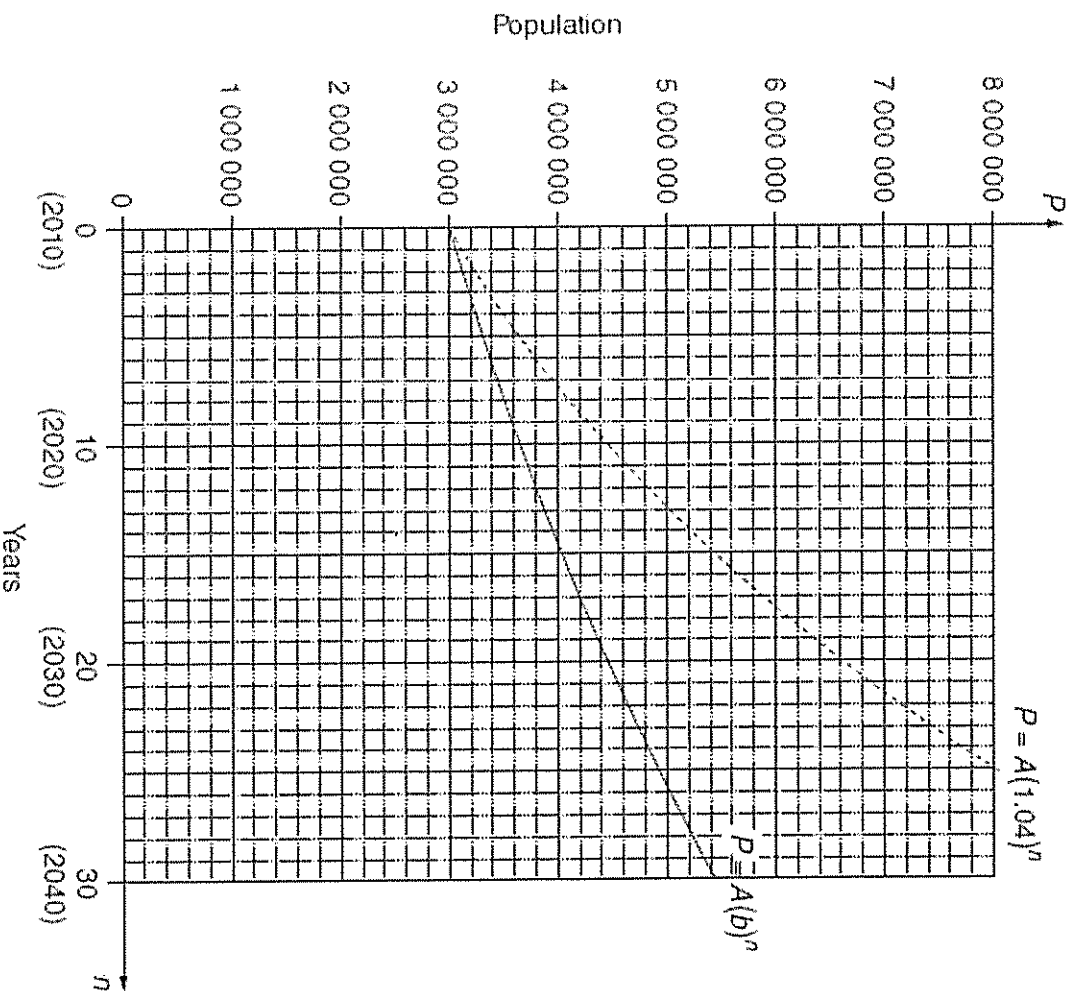
$$P = A(1.04)^n.$$

That year, the city introduced a policy to slow its population growth. The new predicted population was modelled using the equation

$$P = A(b)^n.$$

In both equations, $P$ is the predicted population and $n$ is the number of years after 2010.

The graph shows the two predicted populations.



Population (vertical axis): 1 000 000, 2 000 000, 3 000 000, 4 000 000, 5 000 000, 6 000 000, 7 000 000, 8 000 000

Years (horizontal axis): 0 (2010), 10 (2020), 20 (2030), 30 (2040)

$P = A(1.04)^n$

$P = A(b)^n$

- - - - - Predicted population if the policy had not been introduced
———— Predicted population with the policy introduced

(i) Use the graph to find the predicted population of Thagoras in 2030 if the population policy had NOT been introduced.

1

(ii) In each of the two equations given, the value of $A$ is 3 000 000.

What does $A$ represent?

1

(iii) The guess-and-check method is to be used to find the value of $b$, in $P = A(b)^n$.

(1) Explain, with or without calculations, why 1.05 is not a suitable first estimate for $b$.

1

(2) With $n = 20$ and $P = 4\,460\,000$, use the guess-and-check method and the equation $P = A(b)^n$ to estimate the value of $b$ to two decimal places. Show at least TWO estimate values for $b$, including calculations and conclusions.

2

(iv) The city of Thagoras was aiming to have a population under 7 000 000 in 2050. Does the model indicate that the city will achieve this aim? Justify your answer with suitable calculations.

2