Name: ..... Maths Teacher: .....

# SYDNEY TECHNICAL HIGH SCHOOL

# Year 9

# Assessment 3

# August, 2017

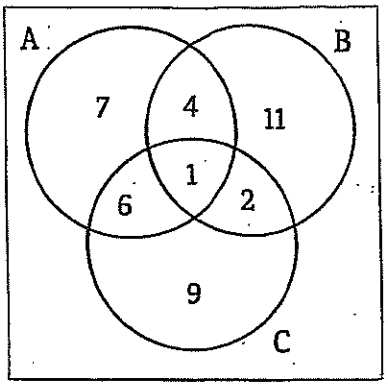
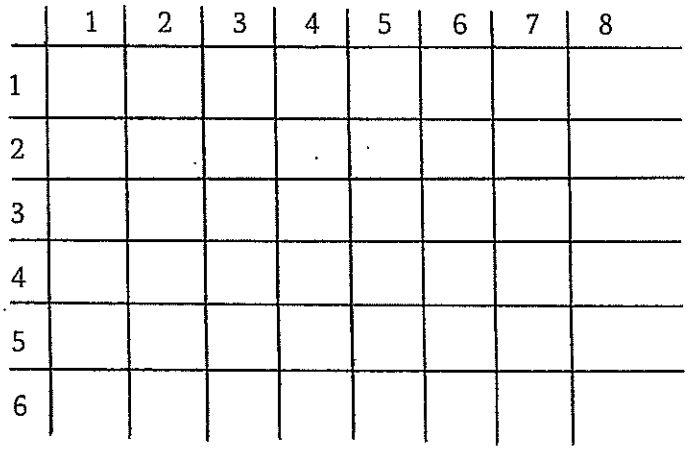
*Time Allowed: 70 Minutes*

General Instructions:

- Unless indicated otherwise, questions are worth 1 mark.
- Approved calculators may be used.
- All necessary working should be shown.
- Full marks may not be awarded for careless work or illegible writing.
- Write using BLUE or BLACK pen.
- Write your answers in the spaces provided.
- Do not spend too long on a question, if stumped – go back to it at the end.

| | |
|---|---|
| Section A Probability | /10 |
| Section B Statistics | /11 |
| Section C Equations/Inequations/ Formulae | /12 |
| Section D Trigonometry | /11 |
| Section E Extension | /12 |
| TOTAL | /56 |

Section A (10 marks) Probability

| | | Answers |
|---|---|---|
| 1. |  <br>This diagram shows the number of alarms that were faulty in switch A, B or C.<br>If one alarm is chosen at random find the probability it had a fault in both switch A and switch C. | |
| 2. | An 8 sided die shows the numbers 1 to 8. A 6 sided die shows the numbers 1 to 6.<br>a) If both dice are rolled together, how many possible outcomes are there?<br>  <br>b) Find the probability the sum of both dice is less than 13. | a)<br>b) |
| 3. | Jamie and Suzie each drew one card from a standard deck of 52 cards. First Jamie drew the three of diamonds and left it face up on the table. Then Suzie drew her card from the pack.<br>What is the probability that Suzie's card is also a 3? | |

4. Harold's dart practice results for last week are shown in the table below.

| Day | Darts thrown | Bullseyes |
|---|---|---|
| Monday | 15 | 5 |
| Wednesday | 24 | 7 |
| Friday | 21 | 6 |
| | $\Sigma =$ | $\Sigma =$ |

a) Find the probability for Harold hitting the bullseye in last week's practice.

a)

b) He trains harder next week and throws 200 darts. Based on this week's results, how often would he be expected to hit a bullseye?

b)

5. A circular spinner has one red sector. The probability of the pointer landing on red on the first spin is $\frac{1}{5}$.

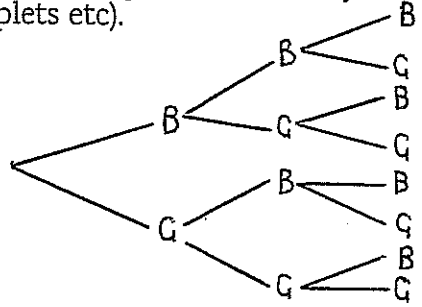
a) What is the probability of landing on red in two spins?

a)

b) What angle does the red sector make at the centre of the circle?

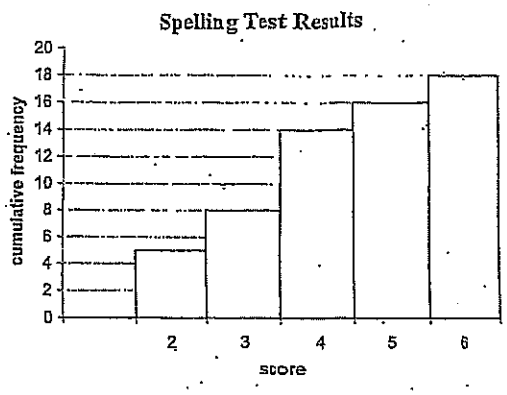
b)

6. In a family of 3 children, find the probability of having two girls and one boy in any order (no twins, triplets etc).




7. From a standard pack of 52 playing cards, a card is drawn at random. Given that it is not an Ace, find the probability it is not a Court card (Jack, Queen or King)?

Section B (11 marks) Statisitics

| | | Answers |
|---|---|---|
| 1. |  <br>A class did a spelling test out of 6 marks and the results are recorded in the above cumulative frequency histogram.<br>a) How many students scored 4 or more in the spelling test?<br>b) Add a cumulative frequency polygon to the graph.<br>c) Hence find the median of the scores. | a)<br>b)<br>c) |
| 2. | <table><tr><th>Score</th><th>Frequency</th></tr><tr><td>11</td><td>5</td></tr><tr><td>12</td><td>4</td></tr><tr><td>13</td><td>1</td></tr><tr><td>14</td><td>6</td></tr><tr><td>15</td><td>4</td></tr></table><br>A score of 13 is added to this sample.<br>a) Find the median. b) Find the mode. | a)<br>b) |

3. A survey of car colours was conducted. Which measure could be used to analyse the data?

A) Mode B) Mean

C) Median D) Range

4. This back to back stem-and-leaf plot displays the test results for a class of 29 students.

| Boys | | | | | Girls | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 9 | 1 | 5 | 1 | 2 | 4 | | |
| | 9 | 7 | 3 | 6 | 0 | 2 | 3 | 5 | |
| 6 | 4 | 2 | 4 | 7 | 4 | 4 | 5 | 9 | 9 |
| | | 3 | 2 | 8 | 3 | 7 | 8 | | |
| | | | 0 | 9 | 1 | 9 | | | |

a) What is the median for the boys? a)

b) What is the median for the girls? b)

c) What is the range for the whole class? c)

5.

| Class | Class Centre (c.c.) | Frequency (f) | fxc.c. |
|---|---|---|---|
| 1-5 | | 3 | |
| 6-10 | | 7 | |
| 11-15 | | 12 | |
| 16-20 | | 8 | |
| 21-25 | | 6 | |
| | | $\Sigma =$ | $\Sigma =$ |

a) Complete the table above.
b) Use it to find the mean correct to one decimal place. b)

## Section C (12 marks) Equation/Inequations/Formulae

1. Solve the following equations

a) $3x - 1 = 5x + 3$ b) $3(x + 4) = (1 - x)$ (2 marks)

c) $\frac{x+3}{4} = \frac{x-2}{3}$ (2 marks)

2. Solve the following inequalities.

a) $2x + 1 > 21$ b) $3x \leq 8 - x$

c) $\frac{1-2x}{3} > 7$ (2 marks)

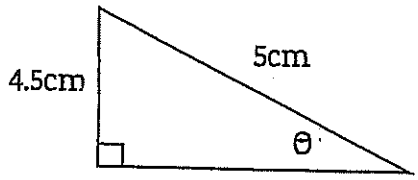
3. Given the formula $V^2 = U^2 + 2as$ find the value of $a$ when $V = 14, U = 4$ and $s = 3$. (2 marks)

4. Make G the subject of the formula:

$$E = \sqrt{\frac{G}{R}}$$

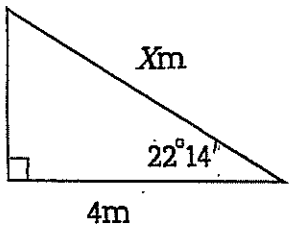
## Section D (12 marks) Trigonometry

1. Find the value of $\theta$ to the nearest degree. (2 marks)

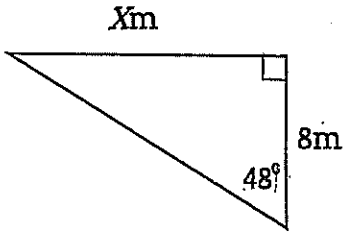



2. Find the value of $x$ correct to 1 decimal place.
(2 marks each)

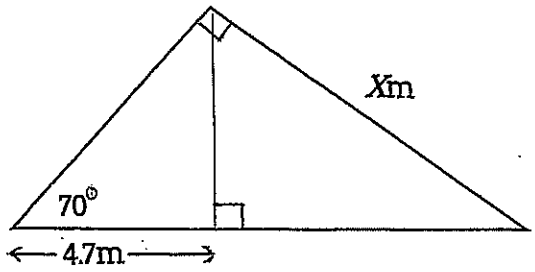
a)



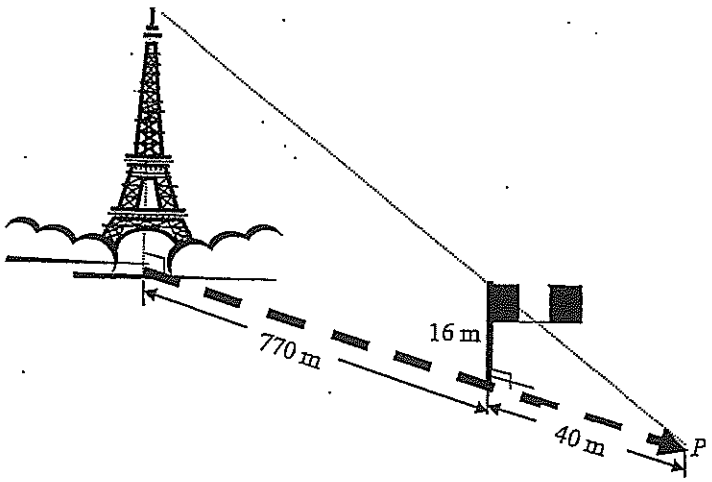

b)




3. Find the value of $x$ correct to one decimal place.
(2 marks)



4. The French flag is on a 16m pole perpendicular to the ground at a position 770m from the foot of the Eiffel Tower in Paris. The ground is level.




At night, a light beam shines from the top of the tower and reaches a point $P$ along the ground, 40m from the flag pole.

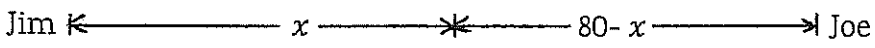
a) By using Trigonometry, find the height of the tower to the nearest metre. (2 marks)

b) What is the angle of depression (to the nearest degree) from the top of the tower to the bottom of the flag pole? (2 marks)

## Section E (12 marks) Extension

1. A bag contains 9 red and 20 white balls. How many red balls must be added to the bag so that the probability of choosing a red ball from the bag is $\frac{3}{4}$? (2 marks)

2. Two bike riders Jim and Joe both start riding towards each other from 80km apart. Jim rides at 30km/h and Joe at 20km/h.




a) If they meet after t hours at a distance of $x$km from where Jim started, write an equation in terms of $x$ to represent this information. (2 marks)

b) Find where they meet.

c) Find how long it takes them to meet.

3. Solve $\frac{m}{4} = 2 - \frac{m+1}{3}$ (2 marks)

4. Make $x$ the subject of the formula

$$P = \frac{x}{x+1}$$ (2 marks)

5. The depreciation formula is given by:

$$A = P(1 - \frac{r}{100})^n$$

where $A$ is the depreciated amount $P$ the original amount, $n$ the number of years and $r$ the rate of depreciation $r\%p.a.$ Find the rate of depreciation $r$ if the original value of a car was \$58500 and after 7 years its depreciated value is \$30000. Give your answer correct to one decimal place. (2 marks)

Name: ..... Maths Teacher: .....

# SYDNEY TECHNICAL HIGH SCHOOL

## Year 9

## Assessment 3

## August, 2017

*Time Allowed: 70 Minutes*

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| | |
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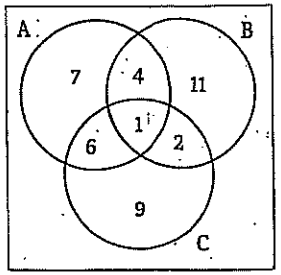
| Section A Probability | /10 |
| Section B Statistics | /11 |
| Section C Equations/Inequations/ Formulae | /12 |
| Section D Trigonometry | /11 |
| Section E Extension | /12 |
| TOTAL | /56 |

Section A (10 marks) Probability

| | | Answers |
|---|---|---|
| 1. |  This diagram shows the number of alarms that were faulty in switch A, B or C. If one alarm is chosen at random find the probability it had a fault in both switch A and switch C. | $\frac{7}{40}$ |
| 2. | An 8 sided die shows the numbers 1 to 8. A 6 sided die shows the numbers 1 to 6.<br>a) If both dice are rolled together, how many possible outcomes are there?<br>b) Find the probability the sum of both dice is less than 13. | a) 48<br>b) $\frac{15}{16}$ $\left(\frac{45}{48}\right)$ |
| 3. | Jamie and Suzie each drew one card from a standard deck of 52 cards. First Jamie drew the three of diamonds and left it face up on the table. Then Suzie drew her card from the pack. What is the probability that Suzie's card is also a 3? | $\frac{3}{51}$ |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | 12 |
| 5 | | | | | | | 12 | 13 |
| 6 | | | | | | 12 | 13 | 14 |

4. Harold's dart practice results for last week are shown in the table below.

| Day | Darts thrown | Bullseyes |
|---|---|---|
| Monday | 15 | 5 |
| Wednesday | 24 | 7 |
| Friday | 21 | 6 |
| | $\Sigma = 60$ | $\Sigma = 18$ |

a) Find the probability for Harold hitting the bullseye in last week's practice.

a) $\frac{18}{60} = \frac{3}{10}$

b) He trains harder next week and throws 200 darts. Based on this week's results, how often would he be expected to hit a bullseye?

b) 60

5. A circular spinner has one red sector. The probability of the pointer landing on red on the first spin is $\frac{1}{5}$.

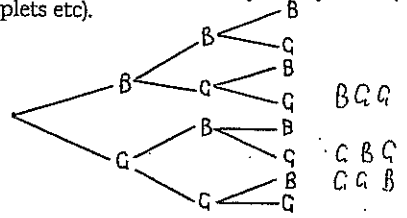
a) What is the probability of landing on red in two spins? $\frac{1}{5} \times \frac{1}{5}$

a) $\frac{1}{25}$

b) What angle does the red sector make at the centre of the circle? $\frac{1}{5} \times 360$

b) $72^0$

6. In a family of 3 children, find the probability of having two girls and one boy in any order (no twins, triplets etc).

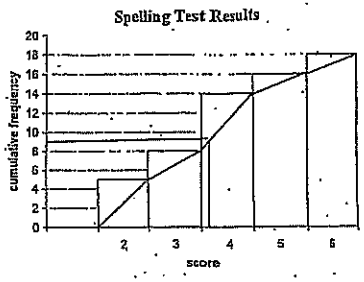
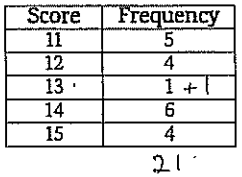



$\frac{3}{8}$

7. From a standard pack of 52 playing cards, a card is drawn at random. Given that it is not an Ace, find the probability it is not a Court card (Jack, Queen or King)? No Ace = 48 cards
12 court cards
36 remaining

$P(\text{not court}) = \frac{36}{48} = \frac{3}{4}$

## Section B ( marks) Statisitics

| | | Answers |
|---|---|---|
| 1. |  <br>A class did a spelling test out of 6 marks and the results are recorded in the above cumulative frequency histogram.<br>a) How many students scored 4 or more in the spelling test? $14 + 16 + 18$<br>b) Add a cumulative frequency polygon to the graph.<br>c) Hence find the median of the scores. | a) 10<br>b)<br>c) 4 |
| 2. |  <br>A score of 13 is added to this sample.<br>a) Find the median. b) Find the mode. | a) 13<br>b) 14 |

| Score | Frequency |
|---|---|
| 11 | 5 |
| 12 | 4 |
| 13 | 1 + 1 |
| 14 | 6 |
| 15 | 4 |
| | 21 |

3. A survey of car colours was conducted. Which measure could be used to analyse the data?

A) Mode B) Mean

C) Median D) Range

A

4. This back to back stem-and-leaf plot displays the test results for a class of 29 students.

| Boys | | | | | Girls | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 5 | 1 | 2 | 4 | | |
| | | 9 | 3 | 6 | 0 | 2 | 3 | 5 | |
| | 9 | 7 | 4 | 7 | 4 | 4 | 5 | 9 | 9 |
| 6 | 4 | 2 | 2 | 8 | 3 | 7 | 8 | | |
| | | 3 | 0 | 9 | 1 | 9 | | | |

a) What is the median for the boys?

$\frac{79+82}{2}$

a) 80.5

b) What is the median for the girls?

b) 74

c) What is the range for the whole class?

99 − 51

c) 48

5.

| Class | Class Centre (c.c.) | Frequency (f) | fxc.c. |
|---|---|---|---|
| 1-5 | 3 | 3 | 9 |
| 6-10 | 8 | 7 | 56 |
| 11-15 | 13 | 12 | 156 |
| 16-20 | 18 | 8 | 144 |
| 21-25 | 23 | 6 | 138 |
| | | $\Sigma = 36$ | $\Sigma = 503$ |

a) Complete the table above.

b) Use it to find the mean correct to one decimal place.

$\frac{503}{36}$

b) 14.0

## Section C (12 marks) Equation/Inequations/Formulae

1. Solve the following equations

a) $3x - 1 = 5x + 3$

$-1 = 2x + 3$

$-4 = 2x$

$x = -2$

b) $3(x+4) = (1-x)$ (2 marks)

$3x + 12 = 1 - x$

$4x + 12 = 1$

$4x = -11$

$x = -\frac{11}{4}$ or $-2\frac{3}{4}$

c) $\frac{x+3}{4} = \frac{x-2}{3}$ (2 marks)

$3x + 9 = 4x - 8$

$9 = x - 8$

$x = 17$

2. Solve the following inequalities.

a) $2x + 1 > 21$

$2x > 20$

$x > 10$

b) $3x \leq 8 - x$

$4x \leq 8$

$x \leq 2$

c) $\frac{1-2x}{3} > 7$ (2 marks)

$1 - 2x > 21$

$-2x > 20$

$x < -10$

3. Given the formula $V^2 = U^2 + 2as$ find the value of $a$ when $V = 14, U = 4$ and $s = 3$. (2 marks)

$14^2 = 4^2 + 2 \times a \times 3$

$196 = 16 + 6a$

$180 = 6a$

$a = 30$

4. Make G the subject of the formula:

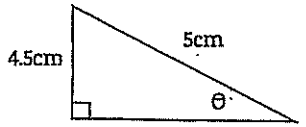
$E = \sqrt{\frac{G}{R}}$

$E^2 = \frac{G}{R}$

$G = RE^2$ or $E^2R$

## Section D ( marks) Trigonometry

1. Find the value of $\theta$ to the nearest degree. (2 marks)

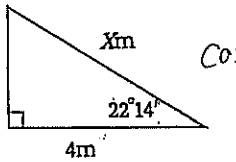



$\sin\theta = \frac{4.5}{5}$

$\theta = 64^\circ$

2. Find the value of $x$ correct to 1 decimal place.
(2 marks each)

a)

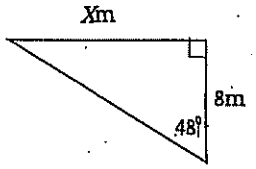



$\cos 22^\circ 14' = \frac{4}{x}$

$x = \frac{4}{\cos 22^\circ 14'}$

$x = 4.3$

b)

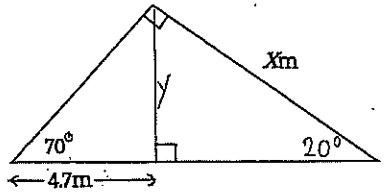



$\tan 48 = \frac{x}{8}$

$x = 8 \tan 48$

$x = 8.9$

3. Find the value of $x$ correct to one decimal place.
(2 marks)




$\tan 70 = \frac{y}{4.7}$

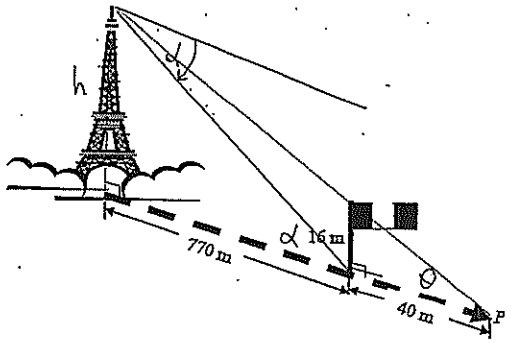
$y = 12.9$

$\sin 20 = \frac{y}{x}$

$x = \frac{y}{\sin 20}$

$x = \frac{12.9}{\sin 20} = 37.7m$

4. The French flag is on a 16m pole perpendicular to the ground at a position 770m from the foot of the Eiffel Tower in Paris. The ground is level.




At night, a light beam shines from the top of the tower and reaches a point $P$ along the ground, 40m from the flag pole.

a) By using Trigonometry, find the height of the tower to the nearest metre. (2 marks)

$\theta = \tan^{-1}\frac{16}{40}$ $\quad \tan 24°13' = \frac{h}{810}$

$\theta = 24.22°$ $\quad h = 810 \tan 24°13'$

$= 24°13'$ $\quad h = 324m$

b) What is the angle of depression (to the nearest degree) from the top of the tower to the bottom of the flag pole? (2 marks)

$\tan \alpha = \frac{324}{770}$

$\alpha = 25°$

**Section E** (12 marks) **Extension**

1. A bag contains 9 red and 20 white balls. How many red balls must be added to the bag so that the probability of choosing a red ball from the bag is $\frac{3}{4}$? (2 marks)

Let $x$ balls be added

$\frac{9+x}{29+x} = \frac{3}{4}$

$36 + 4x = 87 + 3x$

$x = 51$ red balls need to be added

2. Two bike riders Jim and Joe both start riding towards each other from 80km apart. Jim rides at 30km/h and Joe at 20km/h.

Jim ⟵ $x$ ⟶ ⟵ $80-x$ ⟶ Joe

a) If they meet after t hours at a distance of $x$km from where Jim started, write an equation in terms of $x$ to represent this information. (2 marks)

Meet after same time so

$\frac{D}{S}(Joe) = \frac{D}{S}(Jim)$

$\frac{80-x}{20} = \frac{x}{30}$

b) Find where they meet.

Cross multiply

$20x = 2400 - 30x$

$50x = 2400$

$x = 48km$ from Jim is where they meet.

c) Find how long it takes them to meet.

$T = \frac{D}{S} = \frac{48}{30} = 1\frac{3}{5}$ hour or

1 hr 36 minutes

3. Solve $\frac{m}{4} = 2 - \frac{m+1}{3}$ (2 marks)

$12 \times \frac{m}{4} = 12 \times 2 - 12 \times \left(\frac{m+1}{3}\right)$

$3m = 24 - 4(m+1)$

$3m = 24 - 4m - 4$

$7m = 20$

$m = \frac{20}{7}$ or $2\frac{6}{7}$

4. Make $x$ the subject of the formula

$P = \frac{x}{x+1}$ (2 marks)

$Px + P = x$

$Px - x = -P$

$x(P-1) = -P$

$x = \frac{-P}{P-1}$ or $\frac{P}{1-P}$

5. The depreciation formula is given by:

$$A = P(1 - \tfrac{r}{100})^n$$

where $A$ is the depreciated amount $P$ the original amount, $n$ the number of years and $r$ the rate of depreciation $r\%p.a.$ Find the rate of depreciation $r$ if the original value of a car was \$58500 and after 7 years its depreciated value is \$30000. Give your answer correct to one decimal place. (2 marks)

$30000 = 58500\left(1 - \frac{r}{100}\right)^7$

$\frac{300}{585} = \left(1 - \frac{r}{100}\right)^7$

$\sqrt[7]{\frac{300}{585}} = 1 - \frac{r}{100}$

$\frac{r}{100} = 1 - \sqrt[7]{\frac{300}{585}}$

$r = 100\left[1 - \sqrt[7]{\frac{300}{585}}\right]$

$r = 9.1\%$ (to 1 d.p.)