Math 30-1 **Permutations and Combinations**

**REVIEW**

 I. ***Multiple Choice***

 1. A couple is planning an evening out. They have a choice of 4 restaurants for dinner,

 6 movies following dinner, and 4 coffee establishments for after the movie. How many

 different ways can they plan the evening if they choose one of each?

 A. 6

 B. 14

 C. 48

 D. 96

 2. A man has 7 different pets and wishes to photograph them 3 at a time arranged in a line.

 How many different arrangements are possible?

 A. 21

 B. 35

 C. 210

 D. 840

 3. Assume a car license plate consists of 7 characters. The first 3 characters can be any of the

 letters from A to F, but no letter can be repeated. The next 3 characters can be any of the

 digits from1 to 9, but no digit can be repeated. The last character can be any of the letters X,

 Y or Z. An example of this format is: BFA648Y. How many license plates are possible?

 A. 5 040

 B. 181 440

 C. 472 392

 D. 4 084 080

 4. Twelve buttons differ only by colour. There are 4 red buttons, 4 green buttons and 4 yellow

 buttons. If the buttons are placed in a row, how many different arrangements are possible?

 A. 11 880

 B. 34 650

 C. 19 958 400

 D. 479 001 600

 5. How many odd 3-digit whole numbers are there?

 For example, 203 is acceptable but 023 is not.

 A. 360

 B. 450

 C. 500

 D. 900

 6. Determine the number of different arrangements of all the letters in ***APPLEPIE***.

 A. 3 360

 B. 6 720

 C. 40 312

 D. 40 320

 7. From a class of 12 boys and 10 girls a committee of 3 people is selected. How many

 different committees have at least 1 boy?

 A. 120

 B. 540

 C. 1 420

 D. 1 540

 8. Codes with 5 digits are made from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9. If repetitions are not

 permitted and each code must contain 2 odd digits followed by 3 even digits, determine the

 number of different codes that can be made.

 A. 126

 B. 480

 C. 1600

 D. 15120

 9.A class of 14 students is made up of 6 girls and 8 boys. From this class, a group of 5 students

 is chosen to represent the class at a competition. Determine the number of different groups

 of 5 that can be formed if there must be 2 girls and 3 boys in each group.

 A. 71

 B. 560

 C. 840

 D. 10 080

10. North American area codes are three digit numbers. Before 1995, area codes had the

 following restrictions: the first digit could not be 0 or 8, the second digit was either 0 or 1,

 and the third digit was any number from 1 through 9 inclusive. Under these rules, how many

 different area codes were possible?

 A. 112

 B. 120

 C. 144

 D. 504

11. Katie wants to colour a rainbow. She knows the seven colours that make up a rainbow, but

 can’t remember the correct order. How many different ways could the colours be arranged

 assuming each colour is used only once?

 A. 28

 B. 128

 C. 720

 D. 5 040

12. How many 6 digit numbers greater than 800 000 can be made using all the digits

 1, 1, 5, 5, 5, 8 ?

 A. 10

 B. 60

 C. 64

 D. 120

13. In how many ways can four colas, three iced teas, and three orange juices be distributed

 among ten graduates if each graduate is to receive one beverage?

 A. 36

 B. 4 200

 C. 604 800

 D. 3 628 800

14. Solve for *n*: .

 A. *n* = 8

 B. *n* = 7

 C. *n* = 6

 D. *n* = 5

15. Determine the 8th term in the expansion of (2*x* **–** *y*)11.

 A. **–**5280*x*4*y*7

 B. **–**2640*x*4*y*7

 C. 1320*x*3*y*8

 D. 990*x*3*y*8

 II. ***Numerical Response***

 1. A breakfast special consists of choosing one item from each category in the following menu.

 *Juice*: apple, orange, grapefruit

 *Toast*: white, brown

 *Eggs*: scrambled, fried, poached

 *Beverage*: coffee, tea, milk

 The number of different breakfast specials is \_\_\_\_\_\_\_\_\_\_.

 2. Consider the word ***RABBIT***. The number of ways that the letters can be arranged such that

 the two ***B***’s are not together is \_\_\_\_\_\_\_\_\_\_.

 3. A committee of seven members is to be formed from 3 trainees, 4 professors, and 6 research

 associates. The number of ways this can be done if the committee should have 3 professors,

 2 research associates and 2 trainees ***or*** 1 trainee, 2 professors and 4 research associates is

 \_\_\_\_\_\_\_\_\_\_.

 4. In the expansion of , the coefficient of the term containing *a*4*b*2 is \_\_\_\_\_\_\_\_\_\_.

III***. Written Response***

1. a) A class has 30 students. There are 10 boys and 20 girls in the class.

 i) In how many ways can a committee of 4 people be selected from the class?

 ii) In how many ways can an executive committee consisting of a president, a

 vice-president and a secretary be assigned from this class?

 iii) In how many ways can a committee of 3 people be selected from the class if the

 committee must contain 1 boy and 2 girls?

 iv) In how many ways can a committee of 5 be chosen if the committee must consist of

 at least 3 girls?

 b) i) How many groups of 3 chairs can be chosen from 7 chairs if the chairs are all different

 colours?

 ii) How many different ways can 7 chairs be arranged in a row if 2 of the chairs are blue,

 3 are yellow, 1 is red and 1 is green?

 2. a) Solve algebraically: 

 b) Expand the first 3 terms of the binomial: (*x* **–** 2*y*)7.

Math 30-1 **Diploma Prep** Review

***Solutions***

***Permutations and Combinations***

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Multiple Choice*** |  | ***Numerical Response*** |
| 1. | ***D*** | 1. | ***54*** |
| 2. | ***C*** |  |
| 3. | ***B*** | 2. | ***240*** |
| 4. | ***B*** | 3. | ***450*** |
| 5. | ***B*** | 4. | ***2160*** |
| 6. | ***A*** |  |  |
| 7. | ***C*** |  | ***Written Response*** |
| 8. | ***B*** | 1. a) | i)***27 405*** |
| 9. | ***B*** |  | ii)***24 360*** |
| 10. | ***C*** |  | iii)***1900*** |
| 11. | ***D*** |  | iv)***115 254*** |
| 12. | ***A*** | b) | i)***2520*** |
| 13. | ***B*** |  | ii)***420*** |
| 14. | ***B*** | 2. a) | ***n = 16*** |
| 15. | ***A*** | b) |  |

Math 30-1 **Diploma Prep** Review

***Solutions***

***Permutations and Combinations***

 I. ***Multiple Choice***

 1. A couple is planning an evening out. They have a choice of 4 restaurants for dinner,

 6 movies following dinner, and 4 coffee establishments for after the movie. How many

 different ways can they plan the evening if they choose one of each?

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**4 × 6 × 4 = 96**

 B. 14

 C. 48

 D. 96

 2. A man has 7 different pets and wishes to photograph them 3 at a time arranged in a line.

 How many different arrangements are possible?

 A. 21

**7*P*3 = 210**

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 3. Assume a car license plate consists of 7 characters. The first 3 characters can be any of the

 letters from *A* to *F*, but no letter can be repeated. The next 3 characters can be any of the

 digits from1 to 9, but no digit can be repeated. The last character can be any of the letters *X*,

 *Y* or *Z*. An example of this format is: *BFA648Y*. How many license plates are possible?

 A. 5 040

**6 × 5 × 4 × 9 × 8 × 7 × 3 = 181 440**

 B. 181 440

 C. 472 392

 D. 4 084 080

 4. Twelve buttons differ only by colour. There are 4 red buttons, 4 green buttons and 4 yellow

 buttons. If the buttons are placed in a row, how many different arrangements are possible?

 A. 11 880

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 B. 34 650

 C. 19 958 400

 D. 479 001 600

 5. How many odd 3-digit whole numbers are there?

 For example, 203 is acceptable but 023 is not.

 A. 360

**9 × 10 × 5 = 450**

 B. 450

 C. 500

 D. 900

 6. Determine the number of different arrangements of all the letters in ***APPLEPIE***.

 A. 3 360

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 B. 6 720

 C. 40 312

 D. 40 320

 7. From a class of 12 boys and 10 girls a committee of 3 people is selected. How many

 different committees have at least 1 boy?

 A. 120

**All - no boys**

**comb.**

****

 B. 540

 C. 1 420

 D. 1 540

 8. Codes with 5 digits are made from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9. If repetitions are not

 permitted and each code must contain 2 odd digits followed by 3 even digits, determine the

 number of different codes that can be made.

 A. 126

**5 × 4 × 4 × 3 × 2 = 480**

 B. 480

 C. 1600

 D. 15120

 9.A class of 14 students is made up of 6 girls and 8 boys. From this class, a group of 5 students

 is chosen to represent the class at a competition. Determine the number of different groups

 of 5 that can be formed if there must be 2 girls and 3 boys in each group.

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**8 × 2 × 9 = 144**

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 C. 144

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11. Katie wants to colour a rainbow. She knows the seven colours that make up a rainbow, but

 can’t remember the correct order. How many different ways could the colours be arranged

 assuming each colour is used only once?

 A. 28

**7! = 5040**

 B. 128

 C. 720

 D. 5 040

12. How many 6 digit numbers greater than 800 000 can be made using all the digits

 1, 1, 5, 5, 5, 8 ?

 A. 10

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 B. 60

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13. In how many ways can four colas, three iced teas, and three orange juices be distributed

 among ten graduates if each graduate is to receive one beverage?

 A. 36

****

 B. 4 200

 C. 604 800

 D. 3 628 800

14. Solve for *n*: .

**(*n* + 2)(*n* + 1) = 72**

***n*2 + 3*n* + 2 = 72**

***n*2 + 3*n* – 70 = 0**

**(*n* + 10)(*n* – 7) = 0**

***n* = -10, *n* = 7**

 A. *n* = 8

 B. *n* = 7

 C. *n* = 6

 D. *n* = 5

15. Determine the 8th term in the expansion of (2*x* **–** *y*)11.

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 B. **–**2640*x*4*y*7

 C. 1320*x*3*y*8

 D. 990*x*3*y*8

 II. ***Numerical Response***

 1. A breakfast special consists of choosing one item from each category in the following menu.

 *Juice*: apple, orange, grapefruit

 *Toast*: white, brown

**3 × 2 × 3 × 3 = 54**

 *Eggs*: scrambled, fried, poached

 *Beverage*: coffee, tea, milk

 The number of different breakfast specials is \_\_\_\_\_\_\_\_\_\_.

**5 4**

 2. Moving only to the right or down, the number of different paths exist to get from point P

 to point Q is \_\_\_\_\_\_\_\_\_\_.

**1 2 6**

****

 3. Consider the word ***RABBIT***. The number of ways that the letters can be arranged such that

 the two ***B***’s are not together is \_\_\_\_\_\_\_\_\_\_.

**All – B’s together**

****

**2 4 0**

 4. A committee of seven members is to be formed from 3 trainees, 4 professors, and 6 research

 associates. The number of ways this can be done if the committee should have 3 professors,

 2 research associates and 2 trainees ***or*** 1 trainee, 2 professors and 4 research associates is

 \_\_\_\_\_\_\_\_\_\_.

**4 5 0**

****

 5. In the expansion of , the coefficient of the term containing *a*4*b*2 is \_\_\_\_\_\_\_\_\_\_.

**2 1 6 0**

****

III***. Written Response***

1. a) A class has 30 students. There are 10 boys and 20 girls in the class.

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****

 b) i) How many groups of 3 chairs can be arranged from 7 chairs if the chairs are all

 different colours?

****

 ii) How many different ways can 7 chairs be arranged in a row if 2 of the chairs are blue,

 3 are yellow, 1 is red and 1 is green?

****

 2. a) Solve algebraically: 

***n*(*n* – 1) = 10 × 24**

***n*2 – *n* = 240**

***n*2 – *n* – 240 = 0**

**(*n* + 15)(*n* – 16) = 0**

***n* = –15, *n* = 16**

 b) Expand the first 3 terms of the binomial: (*x* **–** 2*y*)7.

****